

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

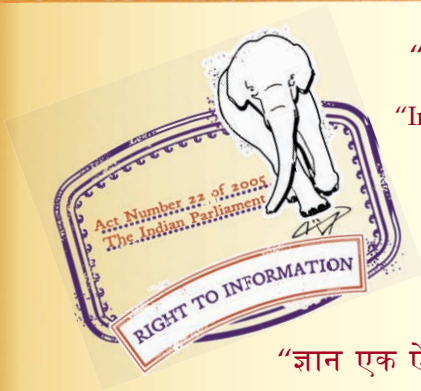
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 13465-3-4 (2006): Resin based reactive compounds used for electrical insulation, Part 3: Specifications for individual materials ; Section 4 Filled polyurethane compounds [ETD 2: Solid Electrical Insulating Materials and Insulation Systems]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



भारतीय मानक

विद्युत्तरोधन के लिए प्रयुक्त रेजिन आधारित
अभिक्रियाशील यौगिक

भाग 3 अलग-अलग सामग्री की विशिष्टियाँ

खंड 4 पूरित पॉलियूरेथेन यौगिक

(पहला पुनरीक्षण)

Indian Standard

RESIN BASED REACTIVE COMPOUNDS USED
FOR ELECTRICAL INSULATION

PART 3 SPECIFICATIONS FOR INDIVIDUAL MATERIALS

SECTION 4 FILLED POLYURETHANE COMPOUNDS

(*First Revision*)

ICS 29.035.01

© BIS 2006

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

NATIONAL FOREWORD

This Indian Standard (Part 3/Sec 4) (First Revision) which is identical with IEC 60455-3-4 (2003) 'Resin based reactive compounds used for electrical insulation — Part 3 : Specifications for individual materials — Sheet 4 : Filled polyurethane compounds' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Solid Electrical Insulating Materials and Insulation Systems Sectional Committee and approval of the Electrotechnical Division Council.

This part of IEC 60455 is one of a series which deals with specifications for resin based reactive compounds used for electrical insulation. This series consists of the following other parts:

- Part 1 Definitions and general requirements, and
- Part 2 Methods of test.

This standard has been revised to align with the latest IEC Standard.

The text of the IEC Standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appear referring to this standard, they should be read as 'Indian Standard'.
- b) Comma (,) has been used as a decimal marker while in Indian Standards, the current practice is to use a point (.) as the decimal marker.

In this adopted standard, reference appears to the following International Standard for which Indian Standard also exists. The corresponding Indian Standard which is to be substituted in its place is listed below along with its degree of equivalence for the edition indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
IEC 60455-2 (1988) Resin based reactive compounds used for electrical insulation — Part 2 : Methods of test	IS 13465 (Part 2) : 2005 Resin based reactive compounds used for electrical insulation : Part 2 Methods of test (<i>first revision</i>)	Identical

The technical committee responsible for the preparation of this standard has reviewed the provisions of the following International Standard referred to in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

<i>International Standard</i>	<i>Title</i>
IEC 60707 (1999)	Flammability of solid non-metallic materials when exposed to flame sources — List of test methods

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

RESIN BASED REACTIVE COMPOUNDS USED FOR ELECTRICAL INSULATION

PART 3 SPECIFICATIONS FOR INDIVIDUAL MATERIALS

SECTION 4 FILLED POLYURETHANE COMPOUNDS

(First Revision)

1 Scope

This part of IEC 60455 contains the requirements for filled polyurethane resinous compounds in the cured form for classes PUR-F-4 to PUR-F-8.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60455-2:1998, *Resin-based reactive compounds used for electrical insulation – Part 2: Methods of test*

IEC 60707:1999, *Flammability of solid non-metallic materials when exposed to flame sources – List of test methods*

3 Requirements

The requirements for filled polyurethane resinous compounds in the cured form are given in Table 2. If not otherwise specified, the requirements are for $(23 \pm 2) ^\circ\text{C}$.

NOTE Materials for use in low temperature conditions may require additional tests not specified in this part of IEC 60455 to establish their suitability.

4 Special requirements

When any of the following special properties are prescribed in the purchase contract, the method of test given below shall be used.

**Table 1 – Requirements for filled polyurethane compounds
in the uncured form**

Property	Method of test in IEC 60455-2 Subclause
Density	5.2
Viscosity	5.3
Shelf life	5.4
Gel time	5.17
Exothermic temperature peak	5.18

Table 2 – Requirements for filled polyurethane compounds in the cured form

Properties		Method of test according to IEC 60455-2	Unit	Value	Requirements for compounds types				
		Subclause			PUR-F-4	PUR-F-5	PUR-F-6	PUR-F-7	PUR-F-8
Density		5.2	g/cm³	Range	1,20 – 1,70				
Flexural strength (3 points) at rupture		6.3.3	MPa	Min.	100	80	60	40	Not applicable
Tensile strength at rupture		6.3.1	MPa	Min.	50		40	15	10
Elongation at break		6.3.1	%		Min. 1		8 – 12	15 – 20	60 – 90
Impact strength		6.3.4	kJ/m²	Min.	10	10	Not applicable		
Temperature of deflection under load		6.4.4.2	°C	Min.	>100	>75	>45	Not applicable	
Glass transition temperature		6.4.4.1	°C	Min.	Under consideration				
Water absorption		6.5.1	mg	Max.	60			100	180
Volume resistivity		6.6.1	Ω·cm	Min.	1 × 10 ¹³		1 × 10 ¹²		
Dissipation factor	23 °C, 48 Hz to 62 Hz	6.6.2		Max.	Under consideration	0,01		0,03	0,06
	90 °C, 48 Hz to 62 Hz			Max.		0,03	0,04	0,08	0,10
Permittivity	23 °C, 48 Hz to 62 Hz	6.6.2		Max.	4 – 5	4,5 – 5,5	5 – 6		
	90 °C, 48 Hz to 62 Hz			Max.	5 – 7				
Electric strength ^a		6.6.3	kV/mm	Min.	20			15	
Tracking resistance		6.6.4			600				
Flammability		IEC 60707			Under consideration				

^a The specimen shall be 3 mm thick and of sufficient area to prevent flashover.

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. ET 02 (5590).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters :

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 2323 01 31, 2323 33 75, 2323 94 02

Telegrams : Manaksanstha
(Common to all offices)

Regional Offices :

	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110 002	{ 2323 76 17 2323 38 41
Eastern : 1/14 C.I.T. Scheme VII M, V. I. P. Road, Kankurgachi KOLKATA 700 054	{ 2337 84 99, 2337 85 61 2337 86 26, 2337 91 20
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160 022	{ 260 38 43 260 92 85
Southern : C.I.T. Campus, IV Cross Road, CHENNAI 600 113	{ 2254 12 16, 2254 14 42 2254 25 19, 2254 23 15
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400 093	{ 2832 92 95, 2832 78 58 2832 78 91, 2832 78 92
Branches : AHMEDABAD. BANGALORE. BHOPAL. BHUBANESHWAR. COIMBATORE. FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. NALAGARH. PATNA. PUNE. RAJKOT. THIRUVANANTHAPURAM. VISAKHAPATNAM.	